Section 3

Issues

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Need for Supplement

In 2004 and 2005 VA undertook advance planning for the first new major hospital projects since the mid 1990's. Since VA policy for the design of new hospital buildings is to provide for their continuing adaptability to changing conditions and programs throughout their structural life (VHA Program Guide PG-18-3, Design and Construction Procedures, Topic 3) and since the VAHBS concept which provides such adaptability was partially outdated (original issue 1972, revision 1977), VA recognized the need for a Supplement to the Red Book to address significant developments in construction and healthcare delivery since 1977. In August 2005 VA commissioned this Supplement Paper as the means to provide uniform guidance to project teams in the application of VAHBS principles.

The VA Hospital Building System was successfully applied to major new or replacement hospital projects completed between 1977 and 1995. The buildings show a variety of design expressions, bay sizes, plan geometries and floor-to-floor heights. Detailed information is provided for three of the facilities in the Appendices. Photos of several other VA Medical Centers have been inserted in Sections 2, 3, and 4.

As the projects using the VAHBS were designed, constructed and occupied details of the system evolved. A number of refinements in the application of systems integration were discovered by the designers, contractors, and VA. This Supplement to the Red Book reports on those developments. There have been numerous and significant changes in the healthcare delivery model, medical technology, and regulatory requirements since 1977. The VAHBS was intended to allow for a high degree of functional adaptability and ease of utility (service) modifications. All of the VAHBS hospital buildings have been occupied for 10 or more years and have undergone varying degrees of modifications. This Supplement includes reports on the adaptability of systems at three of the facilities.

Changes in Health Care Models

The prevailing health care model at the time the VAHBS was developed was centered on inpatient care with a relatively small ambulatory component. Bed towers of 700 to 1000 beds were major components of space in the hospital. Consequently 40 to 60 bed nursing units were the primary driver for the planning modules presented in the VAHBS. Typical designs included a preponderance of 4-bed rooms with a mix of 1 and 2-bed rooms.

Beginning in the 1980's there was a major shift in the health care model from inpatient to outpatient or ambulatory services. Trends in patient privacy also moved design to 20-bed nursing units with all 1-bed rooms.

Existing VAHBS hospitals have proven to be highly adaptable to these changes in health care delivery. New designs must address these changes by designing structural bays and space modules to meet current functional needs while maintaining a high degree of adaptability.

VA Medical Center
Bronx, NY, 1980

Changes in Technology

As technology for healthcare is invented and implemented, continuing changes in functional space and building service will be necessary to support the new equipment and processes. Hospital designs that incorporate adaptable plans and services are essential to continued viability. Over the last 30 years some of the greatest impacts from new technology have been to the electrical, and communications systems.

Digital data networks have become the prevalent means for information transport, necessitating installation of fiber optic backbones, electronic components, and copper station cabling of ever-increasing bandwidth. These requirements were not anticipated when the VAHBS was instituted, and installation of data network cabling has been generally performed with little regard for the organization of VAHBS service systems and subzones; this is in large part due to the fact that most cable plants were not installed as part of the original construction project, but at a later date. Replacement of older telephone cabling, which often accompanied data network installation, was subject to the same lack of discipline. Further, the trend for most special systems such as nurse call and fire alarm to use digital communication protocols, the growth of digital building environmental control systems, the current trend away from coaxial cable to twisted-pair wiring for signal systems such as MATV and CCTV, and the movement towards integration of different systems by gateways or standard protocols (such as Ethernet, BacNet, or TCP/IP) onto a common network have driven the need for structured cabling systems coupled with rigorous installation and maintenance practices. Any systems whose information is transported over the data network become integrated systems by default per this Supplement to the VAHBS. Remaining communications systems are non-integrated and are separately treated in VA design manuals and master specifications.

Changes in Regulatory Requirements

Building codes and, in particular, seismic requirements have become increasingly stringent. Most of these changes affect the specification, detailing, or installation of services, but will not affect the space modules or overall VAHBS concept. However, changes in structural requirements will affect decisions concerning bay size, lateral restraint systems, and member sizes. These will, in turn, influence service zone dimensions, floor-to-floor height, and planning modules.

Fire and life safety codes have undergone numerous revisions since the Red Book was first published. The fire and life safety concepts used for the prototype design in the Red Book were based on a health care model with primarily inpatient care and comparatively small outpatient and administration areas. The usual approach was to consider the entire hospital building as a single institutional occupancy and not to create multiple occupancies. This allowed for expansion or relocation of departments and services without having to worry about occupancy separations. However, requirements for fire and smoke compartments were extended into areas where they might not otherwise have been required. Automatic fire sprinklers were not required nor were they typically installed throughout the building.

As the percentage of outpatient care areas increased, the fire and life safety strategy shifted from single-occupancy to multiple-occupancy buildings. The fire protection strategies for new buildings will need to consider multiple occupancies when establishing fire and smoke compartments, and service modules.

Fire sprinklers are now required throughout VA patient care buildings. Because the service zones in VAHBS buildings featured highly ordered distribution of service systems with allowances for expansion, fire sprinkler systems could be added or extended with minimal disruptions to other services or occupied space. In new buildings fire sprinkler and standpipe systems should be added to the list of integrated subsystems.

JCAHO and AIA/HHS guidelines for hospital design, equipment and systems have been revised several times and may be expected to continue to evolve. While these changes have made some of the specific planning data in the Red Book obsolete, they reinforce the need for designs and building services with high degrees of adaptability.

VA and ASHRAE standards for ventilation rates, energy efficient design, and indoor air quality have been updated and will continue to evolve.

The 2002 National Electrical Code introduced requirements that abandoned, low-voltage communications cabling of many systems be removed in order to reduce the combustible fuel load present in the cable insulation. Much legacy telephone, intercom, coaxial, and other wiring was abandoned in place when newer cable plants were installed in the 1990's. While this concern is moot in regard to the construction of new VA hospitals, it is a critical component of renovation projects in existing hospitals where cabling may or may not have been installed per VA criteria.

Cost and Schedule

Cost

Many of the basic principles and observations contained within the Red Book related to cost still hold true today. However, recent market fluctuations, changes in procurement selection, and amendments to contract requirements have had an effect on many of the Analyses. Future analyses of costs associated with VAHBS building comparisons should therefore give greater consideration to location, market conditions and procurement methods.

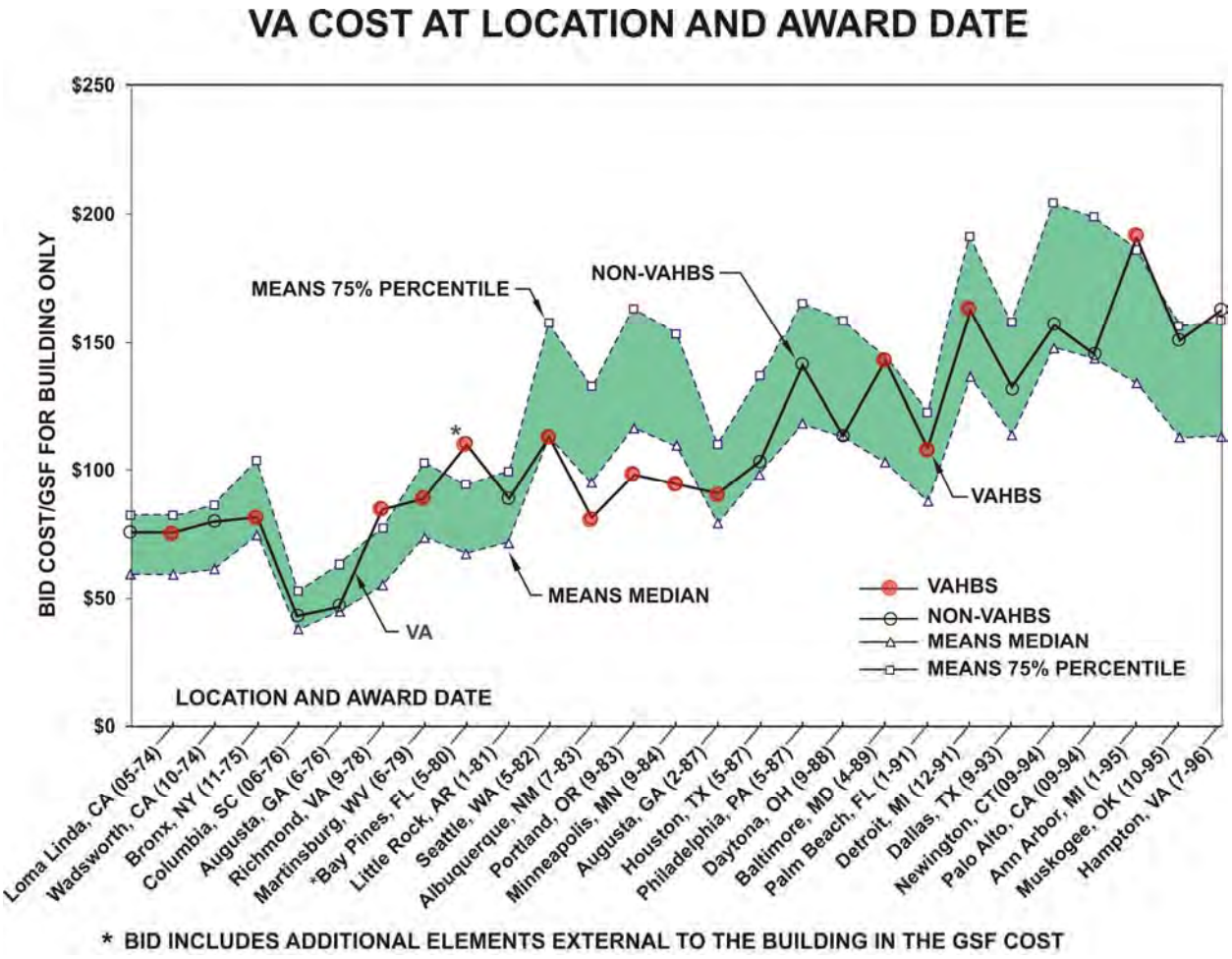
It is extremely important, as stated later in Section 4, to hold thorough pre-bid conferences for prime and sub-contractors, and material suppliers using models, diagrams, video simulations, and other techniques illustrating project sequence and the time and labor saving opportunities inherent in the VAHBS.

Cost of VAHBS Hospitals

A VA Study compared the Bid Cost / GSF for facilities built using VAHBS over a 22 year period (from Loma Linda, CA in 1974 to Hampton, VA in 1996) with R.S. Means cost data for hospital construction over the same period (See Fig Below). Means includes nationwide cost data for hospital types ranging from small, community hospitals to large, complex medical centers (including non-VAHBS construction). VA hospitals tend to be in the category of large to very large medical centers. The median and 75th percentile costs from Means Cost Data were selected as representing costs for hospitals of similar size and with programs similar to VA hospitals.

Except for Bay Pines, the costs for the VAHBS hospitals are at or below the Means 75th percentile. Costs for three of the hospitals (Albuquerque, Portland, and Minneapolis) were below the Means median. It should be noted that the construction contract for Bay Pines included electric powered

vehicles (not normally purchased with construction funds) and an unusually large quantity of exterior canopies and walkways among other buildings on the campus.



Construction Cost

The data from the Medical Centers (Database, Volume 2) used for the Cost Analyses in Volume 3 of the Red Book are now largely outdated simply through the passage of time. While ENR and other Building Cost indices reflect the overall cost increases due to inflation, they do not always address specific Elemental / Trade fluctuations. These may have varied considerably over time thereby "skewing" any direct proportionate link between such general inflation indices and the Cost Analyses outlined in the Red Book. For example, recent volatility in steel and concrete costs has seen these components increase in dramatically greater proportions than other trades. The design team shall use the best available current data for cost estimating, systems comparisons, and life cycle cost analysis.

Life Cycle Costs

Unlike some private sector Owners, VA can be expected to occupy a hospital building for 40, 50, or more years. For such long terms, the costs of operating, maintaining, and altering buildings will usually exceed their first cost several times over. Section 752 in Volume 3 of the Red Book analyzes the savings in housekeeping, maintenance, and alteration for a systems building compared to a traditional building. The general observations and principles contained in Section

752 still apply today and are supported by the experiences and observations of Medical Center Facilities Managers (see Appendix A). The VAHBS permits a much greater ease, time saving, and quality of routine and emergency maintenance, and alterations or changes with substantially less impact on occupied spaces. These factors can be expected to pro\duce cost savings compared to traditional construction. However, methods and procedures used by VA for funding operation, maintenance, and alterations; and tracking expenses still make detailed assignment of costs and analysis difficult (and beyond the scope of this Supplement).

Recent trends in construction costs will likely affect the relationship of Life Cycle Costs to First Costs. For example, construction costs (first costs) would appear to be seeing considerable escalation at present. As noted previously, some sub-systems or components such as steel and concrete are increasing faster than the overall escalation rate. Some portions of the country are affected to a much greater degree than others. Such "spikes" in first costs will affect the relationship between Life Cycle Costs and First Costs. In certain instances, the result may be a longer "pay-back" period for savings in housekeeping, maintenance and renovations.

John D. Dingell VAMC, Detroit, MI 1995

The basic premise outlined in Section 752.5 of the Red Book, i.e., that the cost of major alterations within a VAHBS building are less than those for a conventional building should still hold true. Indeed given the apparent current market place preference by bidding contractors in certain locations, savings may actually be magnified.

General trends suggest that more "difficult" alteration projects with greater phasing, access and temporary work considerations and restrictions are considerably less attractive than "new" build or "less restrictive" alteration construction projects.

The cost of "General Conditions" will be greater than for less restrictive projects and bidders may add a factor for the perceived greater risk. Remodeling in VAHBS buildings compared to remodeling in conventional buildings should offer greater ease of construction, attractiveness to bidders and lower "premiums" for actual and/or perceived risk.

Schedule

The planning, design, and construction of a major new facility takes several years. Shortening the duration of a project reduces the impact of inflation or cost escalation, reduces overhead/general conditions, and delivers services to veterans sooner. The VAHBS includes several strategies with the potential to accelerate the design and construction of new hospital buildings. Because each project will have its own unique combination of opportunities and constraints not all strategies may be applicable to every project.

Planning, Design and Construction

The integrated approach to functional and systems design proposed in the Red Book can shorten the time for planning and design due to earlier involvement by the engineering disciplines. The development of the service modules to be used in the design of each new facility

requires the project team to make basic engineering assumptions for structure and building service systems. The level of detail required is greater than that for typical block or preliminary design. Engineering and systems design is then no longer tied to the development of detailed or "final" room and department layouts. Design development and construction documents for the integrated systems can start earlier than normal. Application of the VAHBS places a premium on examining and coordinating the interrelationships of building services and subsystems early during design.

Modularity, redundancy, and use of typical or repetitive elements in the design of the building systems will reduce the number of "special" conditions. This may simplify the preparation of documents and may make greater efficiencies in procurement and installation possible. Modularity not only promotes a learning curve increasing productivity for the workmen as the building progresses, but it also allows pre-fabrication for many components or sub-systems (duct runs, piping, wireway, etc.).

VA Medical Center
Portland, OR, 1984

Since the design is more "adaptable," the building systems will require fewer modifications or redesign due to changes in the functional plans. Multiple or phased bid packages can be developed and priced with a greater degree of confidence.

Use of assigned subzones and channels, and integration of system during design will reduce conflicts and changes in the field. However, the Contractor still must closely coordinate the work of the various trades and enforce the "rules" established for the service zones.

Remodel and Renovation

The VAHBS includes features that should facilitate the work and reduce impacts on occupied spaces in or adjoining the area of the work. The potential advantages of these features must be clearly communicated to bidders so that benefits in schedule (and consequently costs) may be realized. These features are intended to contain the impacts of the work to as limited an area as possible. By reducing impacts to the functional zone and surrounding occupied areas of the hospital, the need for temporary barriers, temporary utilities, phasing and "domino" moves may be reduced or eliminated.

Features of the VAHBS that facilitate remodel and renovation include modular design, stacked service bays, service risers separated from functional zones, location of service equipment restricted to service bays (out of functional zones and interstitial area), provisions for access to exterior for major equipment replacement, provision of accessible interstitial service zones with dedicated subzones and channels; "over sizing" service mains, equipment rooms, shafts and risers; use of non-bearing partition systems (including smoke and fire) that terminate at interstitial platform; and coordination of fire zone and service module boundaries.